UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE



Summary Review of Monthly Reports*
for
SOIL CONSERVATION SERVICE RESEARCH**
NOVEMBER 1950

Cover Crops and Land Treatment in Relation to Wind Erosion - H. G. Porterfield, Brownfield, Texas.-"The severe drouth that began in early October has continued through November. Only .19 inch of moisture was received during the two-month period against a long-time average of 2.91. This is the second driest fall in 39 years. With this approximate 1/15 normal rainfall for the two months, the top soil has become extremely dry. On many types of cover soil movement has already occurred. Six wind storms which caused soil movement occurred in November and ranged in intensity from light to severe. One severe storm caused some damage to what was considered average cover. The cotton plots planted to winter cover crops in early October have been 100 per cent free of wind erosion; however, the vetch and Austrian winter peas and Dixie Wonder peas are beginning to show the severe effects of drouth. Excellent stands of these winter cover crops were secured. These winter covers were planted with a special type one horse drill adapted to a tractor toolbar. Very little damage to the cotton occurred in seeding.

"Land from which wheat was harvested in 1950 and which was included in rotation for cotton in 1951 has been difficult to hold from blowing. Most of this land has had to be emergency tilled except the plots in this type of rotation which were drilled to winter cover crops of Austrian winter peas and vetch. No wind erosion has occurred under this system of management; however, it is not a common practice as yet in the area. The taller types of combine sorghum have held soil much better than shorter types. The deep broken plots (12 and 20 inches deep) are again outstanding in higher yields and wind erosion control."

Sorghum Yields in Relation to Rotations and Land Treatments - C. J. Whitfield, Amarillo, Texas.-"All sorghum plots were harvested during the past month. Yields were not as high as those in 1949. The great number of sucker heads developing late prevented harvesting at the normal time, and some of the plants went down, reducing yields on the early hegari plantings.

Sorghum in Rotation yields higher than continuous sorghum. The continuous sorghum plots made an average yield of 12.62 bushels per acre as compared to 27.63 bushels per acre from a wheat-sorghum-fallow rotation.

---

* This report is for in-Service use only and should not be used for publication without permission from the Washington Office, Soil Conservation Service Research.

** All research work of the Soil Conservation Service is in cooperation with the various State Experiment Stations.

"Open and graded terraces outyield level closed end terraces. The level closed end terraces made 20.99 bushels per acre and the open end graded terraces 23.97 bushels per acre.

"Subtillage land preparation outyields blank listing. Blank listing made a yield of 8.02 bushels per acre as compared to 19.63 bushels per acre for subtillage. Both areas were planted with a lister at the same time.

"The low yields on the blank listing was caused by water standing in the furrows soon after planting and drowning out part of the crop. Water did not stand in the furrows, as long on the land that had been subtilled previous to planting."

Revegetation of Class VII Land - Harley A. Daniel, Guthrie, Oklahoma.- "During the month a study was made of the progress in revegetation of Class VII land on the Red Plains Station. A fair cover of native grass has been established during the past seven years on 60 acres of formerly eroded pasture. Many gullies, once active, have been stabilized with legume and grass covers. The erosion and runoff has been materially reduced but the productivity of the land is still low. The results obtained in 1950 and reported in the following table show that this Class VII land responds to fertilizer treatments.

| Pasture | Beef Produced (Pounds per Acre) | Pounds of Hay Per Acre |
|---|---|---|
| Cleared brush land, native grass | 68 | 3492 |
| Native grass reestablished on eroded, unfertilized land | 40 | 1379 |
| KR bluestem mixed with weeping lovegrass 1/ on eroded fertilized land 2/ | 88 | 3886 |

1/ Half of pasture mixed with weeping lovegrass.
2/ Superphosphate applied at the rate of 300 pounds per acre and ammonium nitrate at 100 pounds per acre.

"These pastures were grazed during the summer growing season, or approximately 120 days. The fertilized mixture of KR bluestem and weeping lovegrass produced approximately three times more hay than the unfertilized native grass. In other tests where 300 pounds of superphosphate and 100 pounds of ammonium nitrate per acre was applied to KR bluestem, the fertilized plot produced 5.8 times more hay than the unfertilized."

Importance of Topsoil - D. D. Smith, Columbia, Missouri.-"That more efficient use of fertilizing materials is possible on areas of deeper top soil was clearly shown by the 1950 soybean yields on the strip crop field at McCredie. This strip had areas of top soil greater than the normal plow depth and also areas on which there was very little top soil left. Soil tests on these areas indicated a much lower organic matter content associated with the more severely eroded areas. With 2 inches of top soil remaining, the maximum treatment increased bean yields 5.4 bushels per acre, while on areas with 8 to 9 inches of top soil, the same treatment increased the yield 13.1 bushels per acre.

"On areas with 8 to 9 inches of topsoil a net return of about $10 an acre was received for each of the two treatments, but on the areas with only 2 inches top soil the yield increase did not pay for the cost of the fertilizer, one inch of topsoil was worth 1.5 bushels per acre; with starter fertilizer, the value of each inch of top soil was increased to 2.2 bushels; and with both starter and plow sole application, to 2.7 bushels. The yields were as follows:

| Top soil depth: Treatment | 1-3" (Bu/A) | 6" (Bu/A) | 8-9" (BU/A) |
|---|---|---|---|
| Lime only | 14.7 | 22.0 | 24.4 |
| 300 lbs. 3-12-12 in bands on limed soil | 17.3 | - | 31.6 |
| 300 lbs. 3-12-12 in bands on limed soil, and 300 lbs 10-20-20 on plow sole | 20.1 | 33.8 | 37.5 |

Soybean and Corn Yields as Affected by Different Rotations and Cover Crops - "Soybean yields for 1950 were thehighest for the period of study at McCredie. These beans were grown in rotations that provided adequate control of runoff and soil erosion and with a fertilizer cost about one-half that for the corn. The yields by rotation, in which all residues were returned, were as follows:

| Rotation | Bu./Acre |
|---|---|
| Soybeans - Oats & sweet clover | 23 |
| Soybeans - Rye - Grass & legume hay 1 year | 30 |
| Soybeans - Wheat - Grass & legume hay 1 yr. - Corn (rye cover) | 40 |
| Soybeans - Wheat - Grass & legume hay 1 yr. - Corn (rye cover) | 43 |

"All beans were in 7-inch drill rows with the exception of the last rotation (highest yeild), where they were in 21-inch cultivated rows. Weeds were a problem in all beans except those in the 21-inch cultivated rows. They were particularly serious in the soybeans following oats and sweet clover.

"Corn yields on the Sequence Study plots again reflect the need for grass and legume crops in the rotation before corn, along with adequate fertility treatments for high yields. The soil conditioned by the grass and legume crops, which this experiment has shown is necessary for control of water runoff and soil erosion under the corn, enables more efficient use of fertilized materials. Corn yields for these rotations, in which all crop residues are returned to the soil, were as follows:

| Rotation | Bu./Acre |
|---|---|
| Corn-Oats (no treatment) | 28 |
| Corn-Oats & lespedeza (all lespedeza under) | 119 |
| Corn-Oats & sweet clover (sweet clover under) | 117 |
| Corn-Corn-Oats-Grass & legume hay 1 year | 109 |
| Corn-Wheat-Grass & legume hay 1 year | 119 |
| Corn-Wheat-Grass & legume hay 2 years | 116 |
| Corn-Wheat-Grass & legume hay 4 years | 118 |

Nitrogen Developed During Fallow Season Following Legumes and Grasses - Hugh C. McKay, St. Anthony, Idaho.-"The amount of nitrogen developed during the summer fallow season following the plowing up of various soil conserving rotations depends on the rotation used and the method of plowing as shown in the following table:

Pounds of nitrogen developed during the fallow season following the plowing up of various legumes and grasses

| Moldboard Plow | 1st Fallow after Leg. & gr. | 2nd Fallow after Leg. & Gr. | 3rd Fallow after Leg. & Gr. | Total N developed for 3 fallows in rotation |
|---|---|---|---|---|
| Sw. Clover | 25 | 23 | 24 | 72 |
| Sw. Cl. & Grass | 12 | 19 | 25 | 56 |
| Alfalfa | 30 | 30 | 21 | 81 |
| Alf & Grass | 21 | 29 | 25 | 75 |
| Grass | 22 | 21 | 30 | 73 |
| Check | 22 | | | |
| Noble Sweep Plow | | | | |
| Sw Cl. & Grass | 14.0 | | | |
| Alf & Grass | 11 | | | |

"As in previous years, the alfalfa and alfalfa and grass rotations have shown the highest nitrogen development during the fallow seasons. The alfalfa rotation gives the highest total nitrogen development of 81 lbs. but the biggest part of this occurs in the first two fallow seasons. During the last fallow season the nitrogen development dropped lower than the check. This would indicate that the effect of alfalfa alone is not as lasting as when grass is used. When grass is used in combination with alfalfa, the lowest year is the first fallow year with the most nitrogen being developed in the second and third fallow year.

"Sweet clover alone gave a little higher nitrogen development than the check in all three fallow years. Sweet clover and grass gave the poorest results of any of all the rotations. The first two fallow years were considerably below the check and only in the third fallow year did the Nitrogen developed rise above that in the check.

"The straight grass was about equal to the check in the first two fallow years with the third fallow year showing considerable more than the check. This would indicate that the nitrogen tied up by the grass is not liberated again until the third fallow season.

"Plowing some of the sweet clover and grass and alfalfa and grass plots with the Noble sweep resulted in considerable less nitrogen development than where the moldboard plow was used."

Effect of Turf Perforation on Soil Aeration - Geo. R. Blake, New Brunswick, New Jersey.-"Many turf men are now using implements for perforating turf. These implements when drawn across the earth pierce the soil to a depth of about 3-5 inches leaving the soil residue scattered upon the surface. The perforations form a grid about a foot square.

"Better soil aeration is among the beneficial effects listed for implements of this type.

"The possibility of better aeration, as indicated by percentage of air filled pores and by volume weight was investigated on field turf plots being conducted by Ralph Engel of the New Jersey Farm Crops Department. Quadruplicated plots were tilled with such an instrument twice during 1950. Another group of plots was tilled six times and a third group was not tilled. Twenty 3"x3" natural structure cores were obtained from each treatment and were analyzed with results as follows:

| Tillage with perforator in 1950 | Percent air space porosity | Volume weight |
|---|---|---|
| None | 23.2 | 1.47 |
| Two | 21.8 | 1.48 |
| Six | 21.5 | 1.49 |

"There were no significant differences in percentages of air filled pores nor in volume weights between plots tilled and not tilled with the perforator described."

Certain Tobacco Qualities as Affected by Season and Cropping Practice - C. S. Britt, Beltsville, Maryland.-"The Maryland Tobacco Improvement Foundation ran burn and aroma tests on tobacco leaves from some of our experimental plots for the years 1946, 1948 and 1949. The experts who judged the burn and aroma were looking mainly for what they termed 'Maryland flavor,' an aroma desired by foreign tobacco companies that manufacture cigarettes from pure Maryland tobacco.

"Of all the samples tested, only the tobacco from six plots grown during the 1948 season showed any indication of the Maryland aroma. The 1948 tobacco samples tested were all from plots of continuous tobacco grown with 15.2 inches of rainfall. Two out of four plots left bare over winter had some Maryland aroma. Three out of four plots with rye-vetch covers over winter had some Maryland aroma. Two out of four pure vetch plots had the aroma of green, or unripe, tobacco.

"The samples from 1946 and 1949 had no Maryland aroma. These samples included 25 continuous tobacco plots and 15 rotation plots, all grown with 7.1 to 7.7 inches of rainfall. Six of the 25 continuous tobacco plots had the aroma of green, or unripe, tobacco. None of the 15 rotation plots had the aroma of green tobacco.

"The average length of burn for some of the samples tested is given in the table on the following page.

Average length of burn of tobacco leaf samples from selected plots at Beltsville, Maryland, for the years 1946, 1948 and 1949.

| Year Grown | Cover crop when not in tobacco | Length of rotation | Number of plots | Ave. Length of burn* | Inches rainfall during tob. growth |
|---|---|---|---|---|---|
| 1946 | Rye and vetch | Continuous | 1 | 3.0 | 7.7 |
| " | Rye | " | 1 | 2.5 | 7.7 |
| " | Ryegrass | " | 2 | 2.5 | 7.7 |
| " | Grass-Clover sod | 3 yr. | 2 | 2.5 | 7.7 |
| 1946 | Average | | 7 | 2.6 | |
| 1948 | Rye and vetch | Continuous | 4 | 4.0 | 15.2 |
| " | Bare | " | 4 | 4.0 | 15.2 |
| " | Ryegrass and vetch | " | 3 | 3.5 | 15.2 |
| " | Ryegrass | " | 5 | 3.3 | 15.2 |
| " | Vetch | " | 4 | 3.1 | 15.2 |
| " | Wheat and vetch | " | 4 | 3.0 | 15.2 |
| 1948 | Average | | 24 | 3.5 | |
| 1949 | Rye and vetch | Continuous | 3 | 3.5 | 7.4 |
| " | Wheat and vetch | " | 6 | 2.9 | 7.1 |
| " | Old grass-alfalfa sod | 4 yr. | 7 | 2.0 | 7.1 |
| " | Grass-clover sod | 2 yr. | 4 | 2.0 | 7.1 |
| " | Grass-clover sod | 3 yr. | 6 | 2.0 | 7.1 |
| 1949 | Average | | 26 | 2.5 | |

* Rated 1 to 5, 5 = perfect.

"The length of burn was fair or better on all samples except those from rotation plots in 1949. The best burn was obtained in 1948 with tobacco grown under 15.2 inches of rainfall. Continuous tobacco with rye and vetch cover gave the best burn in all years.

"Previous work by the Marlboro Tobacco Station indicates that the burn is related to the balance between nitrogen and potash. Soil tests on our plots indicate that we may be short in potash since we are using fairly high nitrogen levels. We have been over this problem with the Maryland tobacco specialists and they have recommended a heavy supplemental application of potash for all plots before they are plowed this spring. They are hoping that this will give a better burn and perhaps more favorable aroma."

Average Soil Moisture Penetration Per Inch of Rainfall by States 1945-50 - H. H. Finnell, Goodwell, Oklahoma.-"About 1000 additional field records were tabulated during November. The inches of soil wetted per inch of rainfall during the preparatory period has been compiled for 6150 fields during the period 1945-50. Twenty-three districts in 6 of the central and northern Great Plains states are involved. The established program of observation has not been completed in any of these areas, but a partial summary of results was thought to be advisable in order to get a line on the trends of moisture-using efficiency which it is proposed to analyze during the study upon which we began in February, 1950. The following tabulation gives a rough idea of the geographical relations to average moisture-using efficiency:

| State | Number of Observations | Inches Soil Wetted Per Inch of Rainfall |
|---|---|---|
| Montana (northeastern) | 575 | 6.12 |
| North Dakota (northwestern) | 425 | 5.02 |
| South Dakota (south central) | 1981 | 4.04 |
| Nebraska (southwestern) | 501 | 3.96 |
| Colorado (northeastern) | 1575 | 3.97 |
| Kansas (northwestern) | 1093 | 3.86 |

"The variation between districts in Montana ranged from 5.89 to 6.90; in North Dakota from 4.33 to 5.67; in South Dakota from 3.53 to 5.12; in Nebraska from 3.42 to 4.49; in Colorado from 2.29 to 5.49; in Kansas from 3.59 to 4.17. Please note that all of these figures are tentative, in view of the fact that additional data are in the process of being collected at this time, and are being presented only as a preliminary view of the scope of the study which we have undertaken. A similar preliminary compilation will also be made of the data for southeastern Colorado, southwestern Kansas, Northwestern Oklahoma, eastern New Mexico, and the Panhandle of Texas, as fast as tabulations for these areas can be brought up to date.

"The object of the study is to learn as fully as possible the relative importance of specific factors which govern the moisture-using efficiency throughout the Great Plains. The factors which will be tested for possible significance of bearing upon the moisture-using efficiency are listed as follows:

1. Land capability class
2. Soil zone
3. Surface soil texture
4. Land slope
5. Current erosion removals
6. Current erosion accumulations
7. Altitude
8. Latitude
9. Length of preparatory period
10. Mean seasonal temperature
11. Preparatory seasonal rainfall
12. Winter moisture

13. Number of tillage operations
    a. Plowing
    b. Disking
    c. Chiseling
    d. Cultivation
14. Tillage index (volume of soil stirred)
15. Degree of water conservation practiced
16. Preparatory season weed growth
17. Amonnt of crop residues remaining on surface
18. Kind of previous crop
19. Total precipitation contributing to soil moisture store.

"The gross efficiency of the rainfall has been measured by taking the depth of moisture penetration at the close of the preparatory period (approximately the planting time for the oncoming crop) and dividing it by the inches of total precipitation contributing to the soil moisture accumulation. This has been broken down into two increments: (1) the total rainfall of the active preparatory period usually extending from the harvest of the previous crop to the planting of the oncoming crop plus (2) the winter precipitation where a winter season intervenes during the preparatory period.

"While the tabulation of data covering these points is being done, there is being tabulated along with it the information on the kind of crop pursuant to each preparation and the yield produced. The latter information will be used in further studies aimed at rating the productivity of lands, tillage methods, and conservation practices.

"If applicable data of potential evapotranspiration rates can be obtained for the districts in which these studies are being conducted, the correlation with moisture-using efficiency as measured by subsoil storage and with the productivity readings indicated will be sought.

"The conclusion of observations in Ochiltree and Floyd Counties, Texas, is anticipated about January 1, 1951. One or both of these districts will be used in a pilot operation at the statistical laboratory of Oklahoma A&M. College at Stillwater probably early next spring. The results of the pilot analysis will be used as a guide in the continuation of the study of the remaining 49 or 50 Great Plains districts.

"It should be noted probably that the variation in moisture penetration per inch of rainfall within any district, and due to specific causes inherent in the soil or imposed by variations in farming operations, greatly exceeds the order of differences observed between geographic locations (i.e., between states). Hence, it is certain that regional, climatic, and operational factors are all involved in the efficiency of rainfall.

"There is a tremendous amount of work required to prepare the data for machine analysis and undoubtedly much study of the results of the analysis will be necessary to extract the maximum of useful information it may contain. It is my aim, however, to catch up on the tabulation of all our completed records by the time the projected term of field observations is completed. In that way there will be no unnecessary delay in grinding out the information due to the operations people of the three Great Plains regions. Their cooperation has been fruitful, and its continuation promises to be more fruitful."

Soil Splash - E. A. Engdahl, Arnot, New York.-"In our report for October mention was made of the effect of crop mulch on soil splash in our potato experiment. The data had not been calculated at that time, but are presented here.

Soil Splash (August 1 to September 22)

| Treatment | Tons per Acre | Tons per Acre per Inch of Rain |
|---|---|---|
| Fallow and bare | 6.8 | 0.8 |
| Potatoes - no mulch | 2.3 | .3 |
| Potatoes - mulched | 0.6 | .1 |

"Total precipitation for the period was 8.2". There were insufficient records to determine the effect of rain intensity and other factors, but it is known that more than 4 tons per acre of the soil splash on fallow occurred on August 18 - 19 when 2.42" fell in about 48 hours with .29" falling during the last 15 minutes of the storm."

Tillage Methods and Soil Organic Matter - G. R. Free, Marcellus, New York.-"The 54 plots of the method of seedbed preparation experiment were sampled at 0-3" and 3-6" depth for soil organic matter in the fall of 1949. These plots were started in 1945 as a factorial experiment with 3 methods of seedbed preparation (disking, stubble mulch plowing, and turn plowing), 3 rates or methods of fertilization (high commercial, normal commercial, and manure and superphosphate). Another comparison involved in the study is cover crop in the corn of the rotation vs. no cover crop. The only significant differences in soil organic matter were those due to tillage methods.

| | Organic Matter - Percent | |
|---|---|---|
| Tillage | 0 - 3" | 3 - 6" |
| Turn Plowed | 4.49 | 4.40 |
| Stubble mulch plowed | 4.90 | 4.40 |
| Disked | 5.16 | 4.57 |
| LSD 5% | .40 | |
| LSD 1% | .54 | |

"These percentages are all high and show the value of the rotation of corn, oats, wheat, and hay in what amounts to a strip cropping system in maintaining organic matter at a high level. Soil organic matter in the 0-3" depth is significantly greater under crop residue tillage than under conventional plowing. The fact that differences are small and not significant at the 3-6" depth would seem to indicate that placement of residues rather than the method of tillage has been the most important factor in the experiment. It will be interesting to see whether these differences persist with our improved technique of stubble mulch plowing which thus far at least seems satisfactory from the standpoint of crop yields."

DRAINAGE AND WATER CONTROL DIVISION

Hydrologic Studies - L. L. Harrold, North Appalachian Experimental Watershed, Coshocton, Ohio.-"Of the 5.56 inches of precipitation for the month, 2 inches fell as snow, November 23-24. Snow depths averaged 20 to 24 inches with drifts as deep as 6 feet. Activities over the State practically stopped for several days. One work day at the station was lost.

"The ground was warm and not frozen. By November 30, the snow depth had decreased to 1 foot yet the water equivalent had not changed noticeably from the original 2 inches. The snow density increased daily as the heat from the ground melted some of the snow. The snow blanket apparently retained the water. With unfrozen ground, there is a good opportunity for much of the snow melt to be absorbed by the soil.

"An infiltration study of the September 1 storm in which over 4 inches of rain fell in 2 hours revealed infiltration curves for the cornland watersheds different in shape than any previously observed. The initial infiltration rate was much lower than usual and the rate decreased but little during the storm. For example, the initial rate on one area was 0.60 inch per hour and 2 hours later it had dropped only to about 0.40 inch per hour. Exhaustion of pore space in the topsoil was not governing the rate of infiltration. Something else was.

"The soil surface in the cornfields had been in a crusted condition for some time prior to the storm. It appeared that this crust was controlling the infiltration rate and that after the water passed through this thin layer it was transmitted more rapidly into greater depths of the soil. Mr. Dreibelbis reports that an aggregate analysis of the 0-to 1-inch and 1- to 4-inch depths of soil as given below showed definite differences.

Table 1.--Aggregation of the soil at different depths in cornfield (sampled September 25, 1950)

| Location | Depth | Aggregates | | | | Total | Fines | Coef. of aggregation |
|---|---|---|---|---|---|---|---|---|
| | | 8-2 mm. | 2-1 | 1-0.5 | 0.5-0.2 | Aggregates | | |
| | Inches | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | |
| In corn rows | 0-1 | 2.7 | 3.9 | 5.1 | 7.0 | 18.6 | 67.1 | 285 |
| | 1-4 | 4.2 | 4.9 | 6.3 | 7.2 | 22.6 | 63.7 | 298 |
| Between corn rows | 0-1 | .8 | 3.0 | 3.8 | 5.9 | 13.7 | 70.0 | 276 |
| | 1-4 | 3.2 | 3.4 | 4.3 | 5.4 | 16.3 | 66.8 | 289 |

"The greater percent of fine material and the smaller coefficient of aggregation in the surface inch of soil illustrates how much soil structure is damaged by rain drops. Cultivation may have caused some of this destruction to the aggregates. Infiltration curves for storms on these corn watersheds earlier in the season indicated that the soil surface aggregates had not yet been broken down. Rate of water intake into the ground for these periods was governed more by available pore storage."

Hydrologic Studies - J. A. Allis, Central Great Plains Experimental Watershed, Hastings, Nebraska.-"A gentle rain of 0.49 inch on November 2, accounted for most of the 0.63 inch of precipitation recorded at the meteorological station in November. The continued mild weather broke on November 8 and strong northerly

winds with cold weather prevailed during the rest of the month. One of the problems which confront a number of farmers in this region is how to dispose of excess water on areas where there is no natural surface drainage way. These areas are usually located on cultivated land which is almost level and may comprise only a few acres, but in some cases involve more than a section of land. Soils men usually refer to these areas as Scott Soil or hardpan areas. In dry years the land can be farmed without difficulty, but usually water from one or two rains during the year will fill these low spots and not only will the land be non-productive, but an obstacle in farming. It is usually not economical to fill these swamps because of the large quantity of dirt required. Pumps have been installed in some cases to remove excess water, however, for the most part the farmers will contend with them. In the fall of 1949 one farmer about 8 miles from the project built a level terrace completely around his sump, containing about 3 acres. The terrace is high enough so that the water on the outside is diverted down the natural channel. No water enters the low spot except that which actually falls there due to rain or snow. We have been watching this experiment with much interest. This fall we took soil samples for Dr. Duley inside and outside the terrace. According to recent observations by Dr. Duley on infiltration this procedure of building a terrace around these low spots has a good prospect of accomplishing its purpose.

"In 1948 we planted one field outside our experimental watershed and in the leased area to oats and biannual sweet clover. This year corn yields were 52 bushels per acre, which is at least 22 bushels more per acre than was harvested from comparable land under prevailing rotations. The corn in this field was a dark green color all year, which was not the case in an adjoining field where the leaves turned yellow along the stem, indicating a nitrogen deficiency. This field was one of our regular stops during tours in the summer and fall, but little did we realize that the yield would be double that of the check area, however, there was not much question that the corn was far superior. As a matter of record we harvested a sweet clover seed crop from this field in 1949, hence, a year's crop was not sacrificed by including sweet clover in the rotation."

Hydrologic Studies - R. B. Hickok, LaFayette, Indiana.-"October rainfall was significantly below normal, with only traces of runoff occurring from any of the experimental watersheds. Rainfall in November was significantly above normal; but fairly well distributed over the month, with the result that there was little runoff. A total rainfall of almost 2 inches on November 19 and 20, produced scattered runoff with important runoff occurring from two prevailing treatment watersheds, one in old meadow and one previously in beans and recently seeded to wheat. The indications were that the transition stage was being received when soil profiles were approaching saturation above a restricted zone to the surface, and runoff beginning to result from relatively low intensity rainfall. None occurred from the watersheds in corn.

"Soybean yields for the watersheds included in the main experiment are given in the following table. It may be noted that the yield of beans from the prevailing treatment watersheds have been practically the same for the past 3 years that they have been grown; whereas, yields from the conservation watersheds were substantially higher this year than before.

Table 1.--1950 soybean yields from experimental watersheds
Purdue-Throckmorton Farm, Lafayette, Ind.

| Treatment | Wsd. No. | Yield Est., Bu/A** | |
|---|---|---|---|
| | | Mean | Std. Error |
| Conservation | 14 | 38.2 | 0.55 |
| | 18 | 40.7 | .48 |
| | Av. | 39.4 | 1.2 |
| Prevailing | 15 | 28.7 | .41 |
| | 10 | 30.8 | .63 |
| | Av. | 29.8 | 1.0 |
| Treatment Dif. | | 9.6 | Highly significant |

*Conservation treatment included contour seeding and cultivation of beans (40-inch spacing of rows). Prevailing treatment watersheds were straight-rowed. No fertilizer is applied to beans. But, beans on conservation-treated watersheds undoubtedly benefit from residual effects of comparatively heavy fertilization of preceding corn.

**Samples 7' x 7' at 50' x 50' intervals, corrected to 13-1/2 percent moisture.

"Soybeans grown on another watershed under a mulch of residue from the preceding corn crop yielded 33.3 bushels/A. The corn stalks were cut up by discing and the ground tilled to usual plow depth with a heavy spring-tooth field cultivator, with a final light discing before seeding. The preceding corn crop had been similarly grown under a meadow residue mulch. Comparatively unthrifty growth of beans was observed on this watershed during the early part of the summer. The soil is slowly draining and the spring was unusually wet. It seems possible that the mulch prolonged unfavorable moisture and temperature conditions too seriously affect the development of the beans.

"Corn yields on the experimental watersheds are given in the following table:

Table 2.--1950 corn yields from experimental watersheds
Purdue-Throckmorton Farm, Lafayette, Ind.

| Treatment* | Wsd. No. | Yield est., bu/a** | |
|---|---|---|---|
| | | Mean | Std. error |
| Conservation | 6 | 107 | 1.6 |
| | 7 | 116 | 2.9 |
| | Av. | 112 | 3.2 |
| Prevailing | 5 | 75 | 2.2 |
| | 8 | 81 | 2.0 |
| | Av. | 78 | 3.0 |
| Treatment Dif. | | 34 | Significant |

*Conservation treatment included contour cultivation, approximately 6 T. manure and 1,000 lbs. 8-8-8 fertilizer per acre, plowed under, w/150 lbs. of 3-12-12 in row, following Alf.-R.Cl.-Als.-T. meadow (1-yr.). Prevailing treated corn was straight-rowed, w/150 lbs. of 3-12-12 in rows following R.Cl-T. meadow (1 yr.)

**Samples 7' x 7' at 50' x 50' intervals, corrected to 17-1/2 percent moisture.

"The season was not a particularly favorable one for corn. The early summer was unusually wet and cool and the latter part of the growing season was rather dry. The yields of each the conservation and prevailing treated watersheds exceeded their respective averages for the previous 7 years of the experiment by 6 bu./A. The difference in yields between the two treatments this year coincides with the 8-yr. average difference of 34 bu./A."

Hydrologic Studies - Lewis A. Stolzy, East Lansing, Michigan.-"Precipitation for the month of November, as measured by the U. S. Weather Bureau type of standard non-recording rain gages, amounted to 3.03 inches at the cultivated watersheds, 3.12 inches at the wooded watershed, and 2.90 inches at the stubble-mulch plots. These amounts are approximately 122 percent, 126 percent, and 117 percent, respectively, of the 50-year average November precipitation of 2.48 inches. November precipitation can be expected to equal or exceed 3.03 inches once in 4.44 years.

"On November 4 all recording rain gages at the cultivated and wooded watersheds were charged with a solution of sodium chloride with an oil surface given to us by the U. S. Weather Bureau. This charge of sodium chloride is designed to keep all precipitation in a semi-solution form throughout the winter months, eliminating the sublimation, evaporation, and blowing away of precipitation in the form of snow. The first snowfall occurred on November 4, amounting to about a half inch in depth.

"On November 17 the Acting Station Supervisor took Miss Georgia Sloat, Chairman of the Conservation Committee of Lansing Public Schools during the Teachers Convention Week at Michigan State College, and other teachers to inspect the Hydrologic Research Station. After inspecting the watersheds, Miss Sloat remarked, 'I never knew such a place existed so near Lansing.' She felt it would not only be interesting but educational for the teachers of Lansing to make a tour of the watershed at some future date."

Hydrologic Studies - A. W. Cooper, Auburn, Alabama.-"The October rainfall of 1.47 inches represents 55 percent of the 69-year average of 2.66 inches for Auburn. The November rainfall of 0.99 inch represents 29 percent of the 69-year average of 3.42 inches for Auburn.

"Yield measurements of corn and cotton were made on the Erosion Plots. The future high residue plot (No. 9) which this year received 9,706 pounds of green manure (crimson clover), 1,000 pounds per acre 6-8-4, 500 pounds per acre nitrate of soda, and was irrigated produced 90.5 bushels of corn per acre. The future low residue plot (No. 10) which this year received 17,956 pounds of green manure (subterranean clover), 250 pounds per acre 6-8-4, 125 pounds per acre nitrate of soda, and no irrigation produced 58.6 bushels of corn per acre. (Corn yields are based on 56 pounds shelled corn at 15.5 percent moisture.) There was also a noticeable difference in the size of corn kernels. It took 1,574 kernels from plot 9 to weigh a pound and 1,928 kernels from plot 10 to make 1 pound. The amount of cornstalks returned to the plots was 6,080 pounds per acre (dry matter) on plot 9 as compared to 2,410 pounds per acre for plot 10.

"Yields of cotton and stalks returned to plots were measured for all cotton plots (table 1). All yields were low due to poor stands and serious boll weevil damage even though the cotton was poisoned seven times.

Table 1.--Yields of cotton and stalk residue on erosion plots

| Plot No. | Slope % | Yield Seed cotton lb./acre | Dry matter returned to plots as cotton stalks lb./acre |
|---|---|---|---|
| 3 | 5 | 412 | 2,800 |
| 4 | 5 | 588 | 2,980 |
| 5 | 10 | 608 | 3,150 |
| 6 | 10 | 681 | 2,630 |

"These data have very little significance since the plan for the plots is being revised. It was taken as a matter of history record of vegetation returned to the plots.

"Mr. Conniff reported the following results from the irrigated corn plots on the Agricultural Engineering Farm.

Table 2.--Yields from irrigated plots on Agricultural Engineering Farm

| Plot No. | Treatment | Amount of supplemental irrigation water added inches | Yield bu* |
|---|---|---|---|
| 1 | Sprinkler irrigated | 9 | 101.0 |
| 2 | Check | 0 | 50.9 |
| 3 | Furrow irrigated 1 inch per application | 4 | 77.6 |
| 4 | Furrow irrigated 2 inches per application | 7-1/2 | 77.3 |
| 5 | Furrow irrigated 3 inches per application | 10 | 101.2 |
| 6 | Check | 0 | 48.8 |

*Based on 56 pounds of shelled corn at 15.5 percent moisture.

"These plots were located on Lloyd clay loam. North Carolina 1032 variety of hybrid corn was planted and thinned to 20,000 plants per acre. All plots received the same preparation, fertilizer treatment, and number of cultivations.

"In cooperation with S.C.S. Operations personnel, eight infiltration measurements were made with the simulated rainfall infiltrometer (table 3) and eight were made using the infiltration rings (table 4). These tests were made in Marshall, Blount, and Baldwin Counties on Hartselle F.S.L., Pope F.S.L., and Allen, S.L., and Norfolk, F.S.L., respectively.

"Mr. Carter reported permeability measurements (table 5 on eight soils and mechanical analyses on two soils at three depths and one soil at four depths (table 6). The mechanical analyses reported are averages of three tests in each case. These tables appear on the text four pages.

Table 3.--Summary of infiltration tests made with the infiltrometer on Alabama soils (October 1950)[1]

| Test No. | Soil type | Soil surface condition | Infiltration | | | | Initial soil moisture | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total | | Rate at end of | | Depth (inch) | | | |
| | | | 1st hr. | 2d hr. | 1st hr. | 2d hr. | 0-6 | 6-12 | 12-18 | 18-24 |
| | | | Inches | | In./hr. | | Percent | | | |
| 40 | Hartselle F.S.L. | Fair clover sod | 0.95 | 0.51 | 0.64 | 0.50 | 6.93 | 9.75 | 11.03 | 13.58 |
| 41,42 | Hartselle F.S.L. | Fair clover sod | .84 | -- | .11 | -- | 6.93 | 9.75 | 11.03 | 13.58 |
| 43,44 | Pope F.S.L. | Good grass sod | 1.48 | .51 | 1.01 | .29 | 13.07 | 16.76 | 19.98 | 22.44 |
| 45,46 | Allen S.L. | Fair grass sod | 1.20 | .70 | 1.09 | .47 | 10.51 | 13.51 | 15.61 | 15.92 |
| 47 | Norfolk F.S.L. | Fallow | 1.39 | 1.30 | 1.32 | 1.30 | 7.15 | 9.33 | 9.88 | 10.36 |

[1] Data obtained jointly by S.C.S. Research and Operations.

Table 4.--Summary of infiltration tests made with the infiltration rings on Alabama soils (October 1950)[1]

| Test No. | Soil type | Soil surface condition | Infiltration | | | | Initial soil moisture (Depth (inch) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total | | Rate at end of | | | | | |
| | | | 1st hr. | 2d hr. | 1st hr. | 2d hr. | 0-6 | 6-12 | 12-18 | 18-24 |
| 32 | Hartselle F.S.L. | Fair clover sod | 2.40 | 1.55 | 1.68 | 1.45 | 6.93 | 9.75 | 11.03 | 13.58 |
| 33,34 | Hartselle F.S.L. | Fair clover sod | 1.07 | — | .51 | — | 6.93 | 9.75 | 11.03 | 13.58 |
| 35,36 | Pope F.S.L. | Good grass sod | 3.03 | 1.81 | 2.10 | 1.74 | 13.07 | 16.76 | 19.98 | 22.44 |
| 37,38 | Allen Silt Loam | Fair grass sod | 1.52 | .67 | .72 | .64 | 10.51 | 13.51 | 15.61 | 15.92 |
| 39 | Norfolk F.S.L. | Fallow | 3.64 | 2.63 | 2.84 | 2.52 | 7.15 | 9.33 | 9.88 | 10.36 |

[1]Data obtained jointly by S.C.S. Research and Operations.

Table 5.--Permeability of soils, Alabama[1]

| Depth | Field moisture[2] | Moisture content saturated | Percolation: Field moisture[2] | Percolation: Saturated | Volume weight | Water drained: 15 min. | Water drained: 15 hr. |
|---|---|---|---|---|---|---|---|
| Inches | Percent | Percent | In./hr. | In./hr. | Gm/cc | Cc/100 gm | |
| Red Bay Fine Sandy Loam | | | | | | | |
| 1-4 | 4.88 | 15.56 | 4.54 | 6.32 | 1.70 | 4.89 | 12.96 |
| 11-14 | 9.18 | 18.45 | 5.05 | 8.94 | 1.65 | 8.38 | 13.89 |
| 25-28 | 9.11 | 18.71 | 5.38 | 8.12 | 1.64 | 8.42 | 13.74 |
| Vaiden Very Fine Sandy Loam[2] | | | | | | | |
| 1-4 | 10.42 | 26.48 | 3.42 | 2.16 | 1.55 | 2.54 | 6.77 |
| 9-12 | 6.45 | 27.66 | 2.16 | 3.41 | 1.62 | 5.49 | 10.32 |
| 21-24 | 20.04 | 28.94 | 6.30 | 4.21 | 1.56 | 4.34 | 6.56 |
| Alluvial Soil Undiff. (Coastal Plain)[2] | | | | | | | |
| 1-4 | 4.28 | 32.40 | 3.69 | 3.54 | 1.44 | 3.66 | 6.20 |
| 10-13 | 4.19 | 36.49 | 3.24 | 9.33 | 1.38 | 4.94 | 11.82 |
| 18-21 | 2.58 | 30.14 | 2.33 | 5.81 | 1.51 | 3.82 | 5.64 |
| 28-31 | 25.35 | 43.18 | 0.13 | 1.25 | 1.32 | 7.56 | 10.23 |
| Tuscumbia Clay Loam[2] | | | | | | | |
| 1-4 | 13.46 | 40.47 | 8.27 | 3.87 | 1.37 | 8.42 | 14.07 |
| 12-15 | 13.47 | 39.59 | 7.96 | 7.63 | 1.36 | 8.74 | 15.78 |
| 23-26 | 21.41 | 39.47 | 11.66 | 11.27 | 1.36 | 6.90 | 11.72 |
| Madison Clay | | | | | | | |
| 0-3 | 10.55 | 25.79 | 1.26 | .58 | 1.67 | 3.51 | 6.99 |
| 6-9 | 13.69 | 33.20 | .60 | 2.36 | 1.48 | 5.04 | 8.61 |
| 12-15 | 17.82 | 39.42 | 1.45 | 4.15 | 1.39 | 7.42 | 10.65 |
| 18-21 | 17.75 | 40.97 | .65 | 3.52 | 1.39 | 6.62 | 9.73 |
| Norfolk F.S.L. | | | | | | | |
| 2-5 | 2.20 | 30.38 | 1.64 | 2.92 | 1.50 | 1.74 | 6.22 |
| 16-19 | 3.32 | 28.16 | 1.64 | 4.90 | 1.58 | 2.17 | 5.61 |
| 31-34 | 3.96 | 27.04 | .77 | 2.66 | 1.65 | 1.89 | 6.40 |
| Allen Silt Loam | | | | | | | |
| 1-4 | 11.35 | 30.49 | 2.27 | 1.72 | 1.51 | 2.52 | 7.88 |
| 7-10 | 7.85 | 26.50 | .07 | 1.00 | 1.63 | 1.50 | 4.78 |
| 17-20 | 5.36 | 27.17 | 0 | 1.38 | 1.64 | 4.24 | 6.34 |
| Pope Fine Sany Loam | | | | | | | |
| 1-4 | 6.65 | 41.28 | 1.08 | 1.25 | 1.27 | 8.57 | 12.82 |
| 12-15 | 7.17 | 33.73 | .26 | 1.79 | 1.49 | 1.59 | 5.92 |
| 20-23 | 6.47 | 32.56 | .11 | 1.32 | 1.55 | 3.26 | 7.54 |
| Sumter Clay (volume weight only) | | | | | | | |
| 1-4 | | | | | 1.39 | | |
| 10-13 | | | | | 1.48 | | |
| 19-22 | | | | | 1.49 | | |

[1]Data obtained jointly by SCS Research and Operations.

[2]In some cases samples dried considerably in laboratory before tests could be made and had to be moistened.

Table 6.--Mechanical analysis of soils, Alabama[1]

| Particle Size Mm | Particle Description | Faceville - Depth 0"-3" | Faceville - Depth 7"-10" | Faceville - Depth 18"-21" |
|---|---|---|---|---|
| | | Corrected average Percent | | |
| 4-2 | Gravel | 0 | 0 | 0 |
| 2-1 | Fine gravel | .50 | .32 | .40 |
| 1-.5 | Coarse sand | 8.75 | 6.29 | 6.85 |
| .5-.25 | Medium sand | 13.77 | 10.87 | 10.88 |
| .25-.1 | Fine sand | 24.09 | 22.91 | 21.85 |
| .1-.05 | Very fine sand | 11.31 | 13.56 | 11.31 |
| .05-.005 | Silt | 20.52 | 16.63 | 23.16 |
| <.005 | Clay | 21.06 | 29.42 | 25.55 |
| | Total | 100.00 | 100.00 | 100.00 |

| Particle Size Mm | Particle Description | Tuscumbia - Depth 1"-4" | Tuscumbia - Depth 12"-15" | Tuscumbia - Depth 23"-26" |
|---|---|---|---|---|
| | | Corrected average Percent | | |
| 4-2 | Gravel | 0 | 0 | 0 |
| 2-1 | Fine gravel | .24 | .18 | .12 |
| 1-.5 | Coarse sand | .99 | .89 | .78 |
| .5-.25 | Medium sand | .78 | .30 | .16 |
| .25-.1 | Fine sand | 6.95 | 9.54 | 1.79 |
| .1-.05 | Very fine sand | 27.50 | 32.16 | 19.90 |
| .05-.005 | Silt | 27.56 | 26.09 | 33.36 |
| <.005 | Clay | 35.98 | 30.84 | 43.89 |
| | Total | 100.00 | 100.00 | 100.00 |

| Particle Size Mm | Particle Description | Cahaba - Depth 1"-4" | Cahaba - Depth 6"-9" | Cahaba - Depth 12"-15" | Cahaba - Depth 22"-25" |
|---|---|---|---|---|---|
| | | Corrected average Percent | | | |
| 4-2 | Gravel | 0 | 0 | 0 | 0 |
| 2-1 | Fine gravel | .47 | .41 | .46 | .56 |
| 1-.5 | Coarse sand | 13.85 | 12.59 | 12.45 | 13.41 |
| .5-.25 | Medium sand | 22.78 | 18.54 | 16.22 | 16.30 |
| .25-.1 | Fine sand | 27.33 | 22.53 | 20.71 | 20.26 |
| .1-.05 | Very fine sand | 7.56 | 5.27 | 7.25 | 6.93 |
| .05-.005 | Silt | 15.22 | 17.73 | 12.37 | 12.00 |
| <.005 | Clay | 12.79 | 22.93 | 30.54 | 30.54 |
| | Total | 100.00 | 100.00 | 100.00 | 100.00 |

Textural classification as determined by mechanical analysis:
Faceville - sandy clay loam - all levels.
Tuscumbia - clay loam - 1"-4", 12"-15".
clay - 23"-26".
Cahaba - sandy loam - 1"-4".
sandy clam loam - 6"-9", 12"-15", 22"-25".

[1]Data obtained jointly by S.C.S. Research and Operations.

Hydrologic Studies - T. W. Edminster, Blacksburg, Virginia.-"Mr. Holtan reports that '2 days were spent in Staunton in conference with Messrs. Wilson and Warner of the Flood Control Office on estimating runoff from mountainous areas in that vicinity. Based upon agreements reached in that conference, Mr. Wilson together with Mr. Tice of USGS, met with Messrs. Holtan and Kirkpatrick at Blacksburg for a 2-1/2-day session of conferences and assemblage of data pertinent to runoff estimating in the vicinity of Staunton, Va. During the remainder of the period, Mr. Holtan worked primarily on the assemblage of hydrologic data for this purpose. Messrs. Holtan and Kirkpatrick met with R. C. Jones, Zone Conservationist, in the preparation of a paper on the problem of 'Increasing Consumptive Use and Decreasing Ground Water Supplies Challenge the Agriculturist.' This paper is to be presented at Memphis in February before the joint session of the ASAE and the Soil Conservation Section of the Association of Southern Agricultural Workers.

"Mr. Kirkpatrick reports that he has completed a second draft of his pending paper on the 'dependability of Surface Runoff as a Supply for Consumptive Uses of Water.'"

Hydraulic Studies - F. W. Blaisdell, Minneapolis, Minnesota.-"Testing of the box inlet drop spillway was completed by Mr. Donnelly on the 15th, after which he spent a few days in computing and plotting the data. On the 9th I began to write the research report covering the box inlet drop spillway study and continued at this with interruptions during the remainder of the month.

"On November 1 the channel which we have constructed to demonstrate the performance of various soil conservation structures and to provide instruction in the hydraulics of these structures was packed and shipped to Professor R. C. Hay at the University of Illinois, Urbana. It is anticipated that at Urbana the channel will be used for conferences of Soil Conservation Service engineers, for instruction in soil conservation classes at the University of Illinois, and for Farm and Home Week to be held in February 1951.

"On November 14 I attended the meeting of the Committee on Farm Fire Protection of the National Fire Protection Association held in St. Paul, Minn. Attendance at this meeting was at the request of Mr. Earl W. Wheeler, Head, Safety and Health Section, SCS. A purpose of my attending this committee meeting was to observe and report on the use of farm ponds for fire protection purposes. It is interesting that the committee has made the following recommendation which it will transmit to the Soil Conservation Service:

> 'We recommend to the U. S. Soil Conservation Service that so far as possible all farm ponds, dams and waterholes be constructed with a view to the fire safety of the farm buildings nearby, and that the plans prepared should include an all-weather approach and a solid stand for the use of fire apparatus.'"

Hydraulic Studies - W. O. Ree, Stillwater, Oklahoma.-"Some time was spent on a proposed pipe outlet experiment. Four possible sites were explored and surveyed. Preliminary study of possible experimental set-ups were made.

"Further reconnaissance was conducted for suitable watersheds and drainage structures for the runoff study. A few which may be suitable were located. Most culverts, which are to be used as the measuring devices, do not have a free out fall. This requirement eliminates at least 75 percent. Some of the remaining do not have suitable watersheds. However, it is still hoped to find about seven watersheds

within reasonable distance of Stillwater."

Supplemental Irrigation - John R. Carreker, Athens, Georgia.-"William B. Land reports that the rainfall in November was recorded as follows: November 4 - 0.09 inch, November 20 -0.31 inch, and November 25 - 0.03 inch, totaling 0.43 inch. This was 2.48 inches under the long-time average of 2.91 inches. There was excellent soil moisture nearly all of the month following the 7.56 inches on October 19-24.

"Good weather prevailed during the month until the 25th when a Northwest blizzard blew in, causing an all-time November low-record temperature of 4°F. The high temperature that day was only 16°. This severe freeze killed or severely damaged most young fall planted annual crops like crimson clover, oats, rye grass and blue lupine. Perennial grasses and well-established annuals were damaged but apparently not killed.

"The total wind movement was 1,351 miles and evaporation from the pan was 2.32 inches in November.

"One irrigation of 1.50 inches was applied July 3 to four plots of cotton within a terrace adjacent to one of the ponds on the Southern Piedmont Conservation Experiment Station. The effect of this water on the increased plant growth was visible throughout the remainder of the season. The cotton picking record showed the following results:

| | Unirrigated | | Irrigated |
|---|---|---|---|
| | lb/ac | | lb/ac |
| Seed cotton - total yield | 1,087 | | 1,430 |
| Seed cotton increase with irrigation | | 343 lb/ac | - 31.5% |

"On November 16, William B. Land, E. H. Wood, and I attended an irrigation demonstration on the farm of Mr. W. P. Rawls in Lexington County, S. C. Messrs. O. W. Beale and F. F. Lesesne of the Soil Conservation Service and W. P. Law of the South Carolina Experiment Station demonstrated to irrigation equipment dealers and farmers how infiltration rates affect the design of an irrigation system.

"Mr. Rawls spoke on his experiences irrigating his peach orchards. In a personal conversation with Mr. Rawls we learned that he has developed a home-made sprinkler for use in his orchard on Norfolk sand where the infiltration rate is high. A piece of 1 inch pipe 4 inches long was capped on one end. Six holes of 1/8 inch diameter were drilled radially around the pipe just below the cap. The lower end of this pipe was screwed into the riser opening of the irrigation pipe. Water sprayed from the holes in the short riser, reaching each side of the line to the tree row. A line of pipe was laid up each middle. The water did not wash any spray off the peach trees. Mr. Rawls was very proud of his development.

"On November 16, Land and I spent the day in Banks County, Georgia, with B. E. Winn, Soil Conservationist. We looked over the irrigation system on the farm of Mr. M. O. Scoggins, District Supervisor in Banks County. Mr. Scoggins had aluminum pipe and Rainbird No. 40 and 70 sprinklers. Nozzle sizes noted in these sprinklers were 3/16 x 3/16, 1/4 x 3/8, and 3/16 x 1/4. In our conversation with Mr. Scoggins it was apparent he had little conception of the relation between nozzle size and rate of water application on the soil. Smaller nozzles and a longer time of application were needed to control runoff from the irrigation water applied on his fields.

"On the farm of Mr. T. N. Mize, we investigated the possibilities of an irrigation layout. A small branch in which Mr. Winn had measured the flow to be 20 gpm ran through the place. Mr. Mize wished to use this water for furrow irrigation on a field 2,000 feet away but at a lower elevation.

"There was an excellent site for a 2-acre pond adjacent to and below a 30-acre field. We recommended that a pond be constructed and the nearby field be irrigated with portable pipe and rotating sprinklers. This would permit irrigating about 20 acres instead of only 2 or 3 acres."

Drainage Studies - M. H. Gallatin, Homestead, Florida.-"Two periods of light rainfall occurred during this period, the first from November 3 to 5 and the other from November 15 through the 17th. Showers were recorded on 9 days during the entire period with rains of over 1 inch on November 4 at gages 1, 3, and 9. The average rainfall for all of the gages was 1.19 inches varying from 0.08 inch total for the month in the middle southwestern portion of the area to 2.02 inches at the East Glades gage.

"In connection with the mulch plot studies, with little or no rain occurring during the period there was a rapid increase in the readings of the natural cover plot with a slower increase for the check plot. The reason for this is that the check plot had been chopped at the end of the last period leaving a light mulch on the surface. Readings for the shavings, pine straw, and grass-mulched areas increased gradually with greater increase for the pine straw and grass-mulched areas.

"With only a few scattered showers during the period moisture readings increased quite rapidly. During the period of November 17 to the 24 readings made in our citrus (lime) block showed that the trees had reached wilting stage and remained so during the remainder of the month. Readings in the avocado block showed a gradual increase but had not reached wilting stage by the end of the month.

"With only light showers occurring during the period there was no loss of nitrates due to leaching. We have had out on trial a new Urea formaldahyde material that looks very promising. The material has a very slow breakdown and seems to be supplying sufficient amounts of nitrogen for good growth. This material is being compared with a 40 percent material in wide use in the area.

"In connection with the water control studies on the deep marl lands in south Florida, the heavy rains stopped quite early this year and only a few showers occurred after we began pumping. The pumps were started on November 3 and the bedded area was ready for plowing on November 20. The unbedded portion was ready for plowing December 4. There is no doubt that bedding will speed up removal of water. For the past several years we have had to pump until well into December, but since November 24 we have only run the pump once to remove the water that fell in the area.

"Chloride samples were collected, in connection with the conservation of the marl lands of the Homestead Area, in the Miami area on November 29, 1950. Analysis of these samples show that there has been a definite increase in the concentration over the previous sampling. Should this low rainfall condition prevail I believe that unless all precautions are taken the concentration will increase to the point where crops in the area will be injured. I so advised the Dade County Engineers and suggested that all structures be closed to maintain the fresh water head as long as possible.

"Samples collected from the canals of the Homestead area on December 5 show that there has been an increase in the concentration, as indicated in the table below. I believe here again that the barriers should be closed early to maintain a higher fresh water head."

Table 1.--Chloride intrusion into the Homestead Area

| Location | 10/26/50 | 12/5/50 |
|---|---|---|
| Goulds Canal 0.25 mi. east of structure | 4,150.0 ppm | 13,600.0 ppm |
| 300 ft. " " " | 2,550.0 | 9,400.0 |
| 300 " west | 1,880.0 | 9,600.0 |
| .25 mi. " | 670.0 | 4,450.0 |
| .5 " " | 430.0 | 1,750.0 |
| 1.0 " " | 210.0 | 550.0 |
| 1.5 " " | 120.0 | 219.0 |
| 2.0 " " | 160.0 | 550.0 |
| 2.5 " " | 238.0 | 160.0 |
| 3.0 " " | 226.0 | 260.0 |
| Military Canal .25 mi. east of Str. | 11,800.0 | 12,600.0 |
| 300 ft. " " " | 13,100.0 | 26,500.0 |
| 300 " " " " | 8,250.0 | 25,000.0 |
| .25 mi. west " " | 11,090.0 | 15,700.0 |
| .5 " " " " | 3,640.0 | 3,320.0 |
| 1.0 " " " " | 855.0 | 5,500.0 |
| 1.5 " " " " | 194.0 | 800.0 |
| 2.0 " " " " | 111.0 | 160.0 |
| 2.5 " " " " | 118.0 | 212.0 |
| North Canal .25 mi. east of Str. | 13,900.0 | 23,200.0 |
| 300 ft. " " " | 12,300.0 | 32,200.0 |
| 300 ft. west " " | 13,700.0 | 33,000.0 |
| .25 mi. " " " | 27,600.0 | 8,700.0 |
| .5 " " " " | 6,500.0 | 4,050.0 |
| 1.0 " " " " | 2,630.0 | 2,440.0 |
| 1.5 " " " " | 1,290.0 | 1,875.0 |
| 2.0 " " " " | 460.0 | 1,210.0 |
| 2.5 " " " " | 160.0 | 480.0 |
| 3.0 " " " " | 213.0 | 400.0 |
| 3.5 " " " " | 212.0 | 600.0 |
| 4.0 " " " " | 172.0 | 710.0 |
| 4.5 " " " " | 126.0 | 430.0 |
| 5.0 " " " " | 130.0 | 600.0 |
| 5.5 " " " " | 260.0 | 300.0 |
| 6.0 " " " " | 222.0 | 550.0 |
| 6.5 " " " " | 390.0 | 475.0 |
| Florida City Canal .25 mi. east " " | 1,110.0 | 1,900.0 |
| 300 ft. " " " | 595.0 | 610.0 |
| 300 " west " " | 410.0 | 1,450.0 |
| .25 mi. " " " | 250.0 | 1,500.0 |
| .5 " " " " | 536.0 | 800.0 |

Drainage Studies - I. L. Saveson, Baton Rouge, La.-"The cane grinding season was practically well under way throughout the month of November. The sucrose was exceptionally high and yields very good. We had a heavy freeze during November which has ruined a great portion of the cane crop. Planters tell me they

are now leaving approximately 20 percent of the cane in the field since the top part has deteriorated, and it is questionable whether they will be able to save the balance of the crop.

"A second test area was harvested on Cinclare. This is the one on which six narrow cuts (13 rows) were made into three cuts by grading 2 years ago. Cuts are now 28 rows. This particular area showed an increase of 4.14 field tons and 5.14 standard tons increase over the check area which was not graded. Last year this area showed an increase of 7.01 standard tons per acre. This is a total increase for the 2 years of 12.15 tons per acre, and at $7.00 per ton, this shows an increase of $85.05 in gross income at the present prices. Grading work and cost was between $30 and $35 per acre--present prices. Work was continued on the grading of the test pasture area at Cinclare and is approximately 50 percent complete. Wet weather in the last week has stopped operations on this particular project. It is doubtful whether this project will be completed until next spring due to weather conditions.

"The Gar Wood Industries are leaving the Model 306 trencher with us and we are starting some design work to develop a ditcher which will cut any slope of trench and spread the spoil. The development work on this may be held up due to the housing situation here at the University."

Drainage Studies - E. G. Diseker, Raleigh, N. C.-"After much delay, due to the lack of trenching machine repair parts, and weather conditions, the six lines of 4-inch diameter tile were laid. Tile spacing for all plot study was 160 feet apart at depths of 2, 3, and 4 feet with appropriate guard steps between plots. Only an occasional pocket of quick sand was encountered. This was in the 4-foot depth installation. The pockets were only 2 to 3 inches deep, and the tile was laid beneath the quick sand on a firm bed.

"A visit was made with the soil conservation technician at Swan Quarter, and tentative plans are to install test wells on additional plots of Hyde loam soil where the water table is controlled by pumping. Test wells on the organic plot, and the one on the Hyde loam plot at the Mooney farm have been removed for harvesting purposes and are being cleaned for reinstallation in the spring."

Drainage Studies - C. B. Gay, Fleming, Georgia.-"During the month John Thornton and Joe Daniels have made the necessary surveys and supervised the construction of 4,000 feet of ditch along project roads. In addition they surveyed the line for the main outlet canal 4,565 feet long. They have laid out four 3-acre plots, 17 strip plots 1 rod in width, and a number of row plots.

"H. G. Ukkelberg reports the following: Harrowed, limed, fertilized, and seeded two 3-acre plots and the building site to Kentucky 31 Fescue and Ladino Clover. Also, prepared seed bed, limed, fertilized, and seeded 11 strip plots, each 1 rod wide, to different winter legumes and grasses with varying degrees of fertilization. We have one row observational plots where seeded. Prepared seed bed and limed a 3-acre plot to be planted to vegetables in December. The roots were picked up and stump holes filled on another 10 acres of land in preparation for harrowing. Six hundred more fence posts were treated with creosote."

Drainage Studies - T. W. Edminster, Blacksburg, Virginia.-"Mr. Walker, Drainage Engineer, reports the following:

"During the latter part of 1949 a set of sample data were selected and given to

Mr. M. E. Terry of the VPI Statistics Department for analysis. Emphasis was placed upon determining any possible relationships that might exist between the daily fluctuations of water-table positions and barometric pressure, rainfall, humidity, and soil and air temperature.

"After studying the data with local personnel, Mr. Terry discussed the matter with Dr. R. L. Anderson and Dr. H. Hotelling, Statisticians, University of North Carolina. Mr. Terry sent the project the following report on November 13:

> 'The methods of evaluating the water table data was found after some research at the Institute of Statistics to be only a crude approximation, as no known method of accurate evaluation has yet been found. The data now available offer hope of not only giving estimates of the current year but it may be possible to use this data in conjunction with the data of last year to give more information'

"During the past several years, it has been found that the operation of the drainage project in Eastern Virginia was severely handicapped not only by inadequate financial support but also because of the lack of satisfactory control over the areas under investigation. It was further handicapped by inadequate personnel to maintain the equipment during rush seasons or during periods when the drainage engineer found it advisable to be in Blacksburg working on data analysis. Mr. Walker was assigned responsibility of developing a preliminary outline of methods that could be used in overcoming these handicaps. A proposed program is being considered.

"Mr. Walker also reports that some time has been spent in the preparation of a paper on the 'Techniques of Drainage Research in Virginia - Typical of the Southeast.' This paper is to be presented at the Memphis meeting of the Association of Southern Agricultural Workers."

Sedimentation Studies - L. M. Glymph, Jr., Lincoln, Nebraska.-"Five days were spent in Missouri on study of watershed conditions and sediment sources of Ashland Reservoir. A sedimentation survey was made on this reservoir in November 1949 in cooperation with the Missouri Conservation Commission, The University of Missouri Wildlife Research Unit, and the University Soils Department. Additional information on slope lengths and history of land use in the reservoir watershed are now being obtained by Soil Conservation Service Work Group personnel at Fulton, Mo. A report on this study will be prepared when the additional field work is completed.

"On November 30, the project supervisor took part in a panel discussion on 'The Value of Conservation Practices in Flood Control' as a part of the University of Nebraska Farm and Home Days program."

Sedimentation Studies - R. Woodburn, State College, Mississippi.-"A 20-year record on the Yocona River at Enid and a 10-year record on the Tallahatchie River at Etta were found and work was started on flow duration studies.

"Cooperative operations with Professor Glover on the construction of crest gages was completed. Professor Glover's class in Farm Mechanics completed four gages of which two are scheduled for early field installation. Ground cork for these gages was furnished without cost by the Armstrong Cork Company of New Orleans.

"I spoke on November 28 to the Agricultural and Conservation Committee of the Mississippi Economic Council in the Rose Room Heidelberg Hotel, Jackson, on 'Water Resources and Problems in Mississippi.' The paper was discussed by Mr. H. H. Lester, Assistant State Conservationist, Soil Conservation Service, Jackson, Miss.; Mr. Irving E. Anderson, District Engineer, U. S. Geological Survey, Jackson, Miss.,; and Dr. Paul Dunn, Professor of Geology, Mississippi State College.

"The committee expressed great interest in water and soil problems of the State and will very probably be of future help to us in supporting needs for investigations in these fields."

IRRIGATION AND WATER CONSERVATION DIVISION

Water Spreading for Recharge of Underground Basins - A. T. Mitchelson D. C. Muckel, Leonard Schiff, E. S. Bliss, C. E. Johnson - San Joaquin Valley.- "The following table shows the average numbers of total micro-organisms and of fungi together with the average percolation rate at sampling time. Separate samples were taken from the top and bottom portion of each tube:

Table 1.--Micro-organism population and percolation rate of gin-trash treated soil after 60 days incubation under submergence

| Treatment | Total micro-organisms Millions per gram | | Fungi Thousands per gram | | Percolation rate at sampling time cc. per hr. |
|---|---|---|---|---|---|
| | Top | Bottom | Top | Bottom | |
| Control | 72 | 34 | 60 | 6 | 7 |
| 40 T/Acre Gin trash mixed in | 290 | 143 | 8 | 1 | 1 |

"The gin-trash-treated soil contained greater numbers of micro-organisms than the control soil which received no treatment. However, the control soil had greater numbers of fungi than the gin trash even though the soil to which gin trash was added had a much greater amount of energy material available. Both the total numbers of micro-organisms and the numbers of fungi are lower in the bottom portion of both treatments. The fact that both total numbers of micro-organisms and fungi were depressed in the lower portion of the soil column and that the fungi failed to flourish where a copious amount of energy material was available points to the conclusion that anaerobic conditions existed at least in the lower portions of the soil column.

"Northern California.-Precipitation throughout the State of California, except that section south of the Tehachapi, is now considerably above normal. The November precipitation in the Sacramento-San Joaquin Valley areas exceeded all-time records for that period, and flood flows of streams, such as the Merced, San Joaquin, Kings Fresno, Kaweah and Kern, reached a maximum. All the smaller streams, creeks, sloughs, and by-passes were also running full to overflowing, and many thousands of acres of agricultural and cropped lands were inundated. While there was estimated damage of about $20,000,000, there have also been benefits resulting from contribution to the ground-water supply by seepage and percolation from the beds of these streams and sloughs and from the inundated lands. In some cases where we have dams, such as the dams of the irrigation districts, and the Shasta and Friant dams of the Bureau of Reclamation, stream flow can be retarded and released to the lower stream beds according to their ability to contain and percolate the regulated flow. Unfortunately, neither the Pine Flat Dam on the Kings River, nor the Isabella Dam on the Kern River were well enough along to retard or store any of the storm waters. These two structures are being built by the Corps of Engineers."

Yucaipa and Redland Soil Conservation Districts - V. S. Aronovici, Pomona, California.-"At the request of Work Unit Leader, permeability observations were made on two orchards. The first orchard, located in the Yucaipa Soil Conservation District, is gently sloping, group 2 soil, at present under non-tillage clean cultivation planted to mature peach trees. The locations were sampled with the

Uhland-type Soil Sampler. The first location (A) was in the center of the tree rows parallel to the direction of slope. The second location (b) was in the center of the tree rows, normal to the direction of slope. In the first case, considerable organic matter formed a quarter-inch thick protective layer on the ground surface; while in the second location there was no organic matter and the soil was completely exposed. Table 1 compares the permeability rates as observed in the laboratory for the Uhland-type soil samples for these two locations.

Table 1.--Comparison in permeability rates as observed in the laboratory for Uhland-type soil samples in the Knudson Property, Yucaipa Soil Conservation District

| Station | Max. of Min. average | Soil permeability observation | | |
|---|---|---|---|---|
| | | 0-3 inch depth | 3-6 inch depth | 6-9 inch depth |
| | | Ins./hr. | Ins./hr. | Ins./hr. |
| A | Maximum | 0.83 | 0.70 | 1.06 |
| | Minimum | .39 | .56 | .95 |
| B | Maximum | .14 | .24 | 1.66 |
| | Minimum | .14 | .08 | .62 |

"It is quite apparent from these data that the surface mulch at Station A has assisted in maintaining better infiltration conditions than in the case where there was none. The 3 to 6-inch depth indicates that there is some difference in degree of plow-soil development in the up-and-down-hill tree rows as against the cross-slope tree rows. Note that in the 6- to 9-inch depth there is no significant difference between the two locations. From these very preliminary observations, it is slightly apparent that the runoff from sprinkler irrigation is due primarily to the poor quality of the surface soil condition, particularly in the areas represented by Station B.

Lower Colorado River Water Use Study - Harry F. Blaney, Los Angeles, California.-"With the assistance of G. Marvin Litz, compilation of data on consumptive use of water by agricultural crops and native vegetation and evaporation from water surfaces was continued. The following tabulation gives an example of tentative estimates of rates of consumptive use in Coachella Valley, Calif., based on climatological and irrigation data.

| Crop | Growing period | Consumptive use | | |
|---|---|---|---|---|
| | | Factor (F) | Coefficient (K) | Rate[1/] (U) |
| | | | | Inches |
| Alfalfa[2/] | 2/6-12/12[3/] | 54.55 | 0.85 | 46.37 |
| Alfalfa | 12/12 - 2/6 | 8.30 | .60 | 4.98 |
| Cotton | 4/1 - 10/31 | 53.38 | .62 | 33.10 |
| Dates | Annual | 75.00 | .65 | 48.75 |
| Flax | 11/1 - 5/31 | 35.66 | .80 | 28.53 |
| Grapes | 2/1 - 6/30 | 32.05 | .60 | 19.25 |
| Grapefruit | Annual | 75.00 | .60 | 45.00 |
| Grain, small | 11/1 - 4/30 | 27.99 | .70 | 19.58 |
| Truck | 10/1 - 6/30 | 50.07 | .65 | 32.54 |
| Carrots | 10/1 - 6/30 | 50.07 | .70 | 35.05 |
| Corn (sweet) | 2/1 - 5/31 | 23.56 | .75 | 17.67 |
| Melons | 12/1 - 6/30 | 39.72 | .65 | 25.82 |
| Tomatoes | 11/1 - 5/31 | 35.66 | .75 | 26.75 |

1/ Computed by formula U = KF. 2/ Includes irrigated pasture. 3/ Alfalfa and pasture given rest from August 1 to September 15.

Irrigation Water Management and Drainage Practices in the Production of Hay and Forage in the High Mountain Valleys of Colorado - H. K. Rouse, Gunnison, Colorado.-"A compilation of the yields of hay in tons per acre corrected to 12-percent moisture from the 512 sub-plots of the Factorial Experiment at the Blackstock Experimental Area has been completed. Analyses of these data are in progress and the over-all summaries completed. The results of the four factors being studied show comparative over-all yields as follows:

1. Irrigation Practices:

| | |
|---|---|
| Sprinkler Irrigation | 100% |
| Surface Irrigation, 10-day interval | 92% |
| Surface Irrigation, Continuous | 91% |
| Surface Irrigation, 15-day interval | 85% |

Because of a start late in the season and some interruptions in the planned schedule of irrigation, too much credence should not be placed on these figures pending a verification during another season.

2. Seeding Legumes in Native Sod:

| | |
|---|---|
| Check Plots | 100% |
| Seeded Plots | 98% |

Although a complete analysis has not been made, a preliminary inspection of the data indicates the difference is without significance. This is in agreement with expectations.

3. Fertility Trials:

| | | |
|---|---|---|
| Check Plots - no treatment | | 100% |
| $P_2$ | 200 lb. $P_2O_5$ per acre | 107% |
| $N_1$ | 40 lb. N per acre | 139% |
| $N_2$ | 80 lb. N per acre | 151% |
| $N_3$ | 160 lb. N per acre | 195% |
| $N_3P_1$ | 160 lb. N plus 100 lb. $P_2O_5$ per acre | 193% |
| $N_3P_2$ | 160 lb. N plus 200 lb. $P_2O_5$ per acre | 198% |
| $N_3P_3$ | 160 lb. N plus 400 lb. $P_2O_5$ per acre | 197% |

As might be expected, in the native meadow vegetation which included few legumes, the response to phosphorous during the first year is negligible, while the response to nitrogen is great.

4. Date of Harvest:

| | |
|---|---|
| Last Harvest (August 28) | 100% |
| Early Harvest (July 20) | 86% |
| Early Harvest plus aftermath growth | 98% |

These figures are of no particular interest since they are merely ratios of total tonnage yields. Chemical analyses of protein content are being made and are expected to yield important data.

"Analyses to determine the various interactions among the several factors are in progress. A comparison of the results of different irrigation practices on the eight different fertilizer trials show that Sprinkler Irrigation resulted in maximum yields for all fertility levels and that Surface Irrigation at 15-day intervals resulted in the lowest yield for all levels. As between Surface Irrigation, Continuous, and Surface Irrigation at 10-day intervals, there is little choice, the 10-day interval giving the second highest yields at five of eight levels and

continuous surface irrigation at three of eight levels."

Irrigation Studies - Clyde E. Houston, Reno, Nevada.-"The first year preliminary records for the evapo-transpiration tanks show that alfalfa with an oven dry plus 10 percent yield equivalent of 1.1 tons per acre, used 24.8 inches of water, and the pasture tanks with a yield of 1.5 tons per acre used 30.6 inches. The main value of these data are to show that there is a high use of water in getting crops started. The pasture consisting of an alfalfa, bromegrass, fescue mix had to be planted twice and much of the water applied for seed germination was used by direct evaporation from the soil. Similarly with the alfalfa, four seedlings were placed in each tank leaving about 80 percent of the tank surface exposed as bare soil. Next seasons results should show a decided increase in crop yields with only a slight increase in water use.

"Abnormally heavy rain inthe Sierra snow blanket up to 3 feet depth, during the period November 16 through 20th, produced a flood in Truckee and Carson Valleys. A personal reconnaissance before, during, and after the flood indicates that the major monetary loss was by Reno business houses and residences within one-half block on both sides of the river, and by the Highway Department of California and Nevada. Basements and street level first floors in Reno were flooded, with much silt deposited. A few bridges had their approaches destroyed and probably 1,000 feet of main highway was washed away. Much of the bridge approach damage was caused by debris lodging against piers in the streambeds. There was practically no damage to structures or approaches having clear spans.

"Probably the main agricultural damage was to headgates and some canals which divert water directly from the rivers. Although some agricultural land was inundated there was very little cutting of clean-cultivated land and practically none on fields of alfalfa or pasture. There was a slight amount of damaging silt deposition on farm land. On the beneficial side was the deposition of silt on sandy soils, a late irrigation to bring the soils to field capacity prior to next season's crop year, and a tremendous increase in reservoir storage. Lake Lahontan now contains the greatest storage on this date in 35 years."

Irrigation Studies - F. M. Tileston, Ontario, Oregon.-"At the annual cooperators conference in January 1950 it was decided to continue experimentation on only the grass plots on the experimental farm. The primary reason for continuing these plots was to determine how efficiently they could be irrigated. The plots were to be irrigated in such a manner as to apply just enough water at each irrigation to bring them to field capacity, the runoff was to be reduced to a minimum during the course of each irrigation and still adequately irrigate the plots. To establish a complete inventory of the water applied, soil-moisture samples were taken from the plots before and after each irrigation. From the soil-moisture determinations, and by measuring the water applied and runoff the plots, the field-irrigation efficiencies and the percolation loss were calculated.

"A summary of the results is shown in table 1. These results are an average of four plots for each irrigation and the average shown at the bottom of each column is the average for all irrigations of all plots for that particular corrugation shown. The field efficiency is obtained by dividing the amount of water retained in the 3-foot soil profile, as determined by soil-moisture sampling divided by the total amount of water applied to the plot. The percolation loss is obtained by adding the runoff percent to the field efficiency in percent and subtracting this sum from 100 percent. In some cases the sum of these two columns was equal to more than 100 percent in which case the answer shown is marked by a plus.

Table 1.--Averages of runoff, field efficiency, and percolation loss in percent for 24-inch and 15-inch grass plots

| Plots | Runoff percent | Field efficiency percent | Percolation loss percent |
|---|---|---|---|
| AVERAGE OF 24-INCH CORRUGATED GRASS PLOTS | | | |
| 4, 8<br>20, 23 | 22.2 | 71.1 | 6.8 |
| AVERAGE OF 15-INCH CORRUGATED GRASS PLOTS | | | |
| 7, 12<br>17, 26 | 17.8 | 81.6 | .6 |

"Since the actual water measurements are felt to be reasonably accurate, the major source of error resulting in an indication in some cases that more water is retained than was applied should lie in the soil-moisture determinations. This would indicate that not enough soil-moisture samples were taken to completely establish a true average figure for the amount of water retained.

"The same data are shown for comparison for the farm field plots studies (table 2). In comparing the two sets of data for field efficiencies the average for the farm field plots is considerably lower than those obtained on the experimental plots. This would necessarily be true because on the experimental plots the irrigation water was controlled to a high degree and just enough water was added to bring the plots to field capacity.

"Close examination of the data from the farm field plots shows that the runoff percent is not too much greater than the runoff percent for the station plots but the percolation loss is considerably higher than the percolation loss secured on the station plots. This would indicate that on the farm fields there is considerable water being lost through deep percolation. This does not mean, however, that the lower field efficiency is due largely to a greater percolation loss because these determinations were based on soil samples taken only to a 3-foot depth and there is little doubt that moisture extraction occurred in the deeper depths which would lower the percolation loss as shown."

Table 2.--Summary of averages of runoff, field efficiency, and percolation loss in percent for farm field plots

| Farm field | Crops | Runoff percent | Field efficiency percent | Percolation loss percent |
|---|---|---|---|---|
| No. 1 | Alfalfa | 31.5 | 46.8 | 21.7 |
| No. 2 | Alfalfa | 29.4 | 49.8 | 20.8 |
| No. 3 | Clover | 24.1 | 39.5 | 36.4 |
| No. 4 | Corn | 12.1 | 48.1 | 39.8 |

Evaporation Studies - D. W. Bloodgood, Austin, Texas.-"Evaporation data for all of the cooperative stations in Texas up to and including October 1950 have been computed and assembled in tables. A summary of these data is included with this report. These tables will appear on the next five pages.

Irrigation Studies - P. E. Ross, Peslaco, Texas.- "The use of inter-planted crops with the young citrus trees is advantageous in using irrigation water between tree rows where the young citrus tree roots are not yet feeding. This was substantiated from observation of fallowed and cropped areas."

1/8/51

Table 1.--Results of cooperative irrigation studies in Texas for the irrigation season of 1950 (through October 1950)

| County | Location | Total irrigated land | Crops: Area | Crops: Kind | Crops: Proportion of total | Irrigation season: Beginning | Irrigation season: Ending | Irrigation season: No. days | No. of irrigations | Source of water supply | Amount of irrigation water applied per acre | Rainfall | Total amount of water available for plant use |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acres | Acres | | Percent | | | | | | Acre-feet | Feet | Ac.-ft./ac. |
| Maverick | Hopedale-Eagle Pass area[1] | 27.25 | 27.25 | Mixed vegetables | 100 | 10/8/49 | 5/6/50 | 210* | 34* | River | 0.79 | 0.76 | 1.55* |
| Maverick | same as above | 27.25 | 3.13 | Egg plant | 11.5 | 8/12/50 | 11/11/50 | 92* | 36* | River | .76 | .53 | 1.29* |
| | | | 3.12 | peppers | 11.5 | | | | | | | | |
| | | | 4.50 | Tomatoes | 16.4 | | | | | | | | |
| | | | 8.50 | Cauliflower | 31.2 | | | | | | | | |
| | | | 8.00 | Mixed veg. | 29.4 | | | | | | | | |
| Maverick | Lateral 71-B Eagle Pass area[2] | 882.20 | 75.80 | Alfalfa | 8.6 | 1/1/50 | 2/28/50 | 59 | - | River | | .09 | |
| | | | 60.00 | Broccoli | 6.9 | 6/1/50 | 9/28/50 | 120 | - | River | 2.44 | .41 | |
| | | | 216.10 | Cotton | 24.5 | Total Season | | 179* | - | | | .50 | 2.94* |
| | | | 100.00 | Wheat | 11.3 | | | | | | | | |
| | | | 100.00 | Barley | 11.3 | | | | | | | | |
| | | | 75.00 | Tomatoes | 8.5 | | | | | | | | |
| | | | 255.30 | Oats | 28.9 | | | | | | | | |
| Maverick | Tortuga Farm Eagle Pass area[3] | 12.5 | 12.50 | Cotton | 100 | 4/16/50 | 8/1/50 | 107 | 4 | River | 1.33 | .62 | 1.95 |
| Harris | Ray Wood farm Hockley Area[4] | 280 | 280 | Rice | 100 | 5/23/50 | 10/10/50 | 140 | - | Well | 2.34 | 1.51 | 3.85 |
| Waller | J.D.Wood farm Brookshire Area[5] | 330 | 330 | Rice | 100 | 5/15/50 | 8/25/50 | 103 | - | Well | 2.04 | 1.44 | 3.48 |
| Jackson | Stafford farm Edna area[6] | 630 | 630 | Rice | 100 | 4/28/50 | 8/15/50 | 110 | - | Well & River | 2.98 | .90 | 3.88 |
| Jackson | Babbs farm Edna area[7] | 470 | 470 | Rice | 100 | 4/18/50 | 9/10/50 | 145 | - | Well & River | 3.69 | 1.25 | 4.94 |

(continued on page 2)

Table 1 continued

| County | Location | Total irrigated land | Area | Crops: Kind | Crops: Proportion of total acreage | Irrigation season: Beginning | Irrigation season: Ending | Irrigation season: No. days | No. of irrigations | Source of water supply | Amount of irrigation water applied per acre | Rainfall | Total amount of water available for plant use |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acres | Acres | | Percent | | | | | | Acre-feet | Feet | Acre-ft./acre |
| Dimmit | Tex. Agr. Expt. Sub-Sta. #19 Crystal City area[8] | 70 | 6 | Citrus | 8.6 | 2/1/50 | 10/31/50 | 273* | - | Well | 1.90[9] | 1.81 | *3.71 |
| | | | 4 | Dates | 5.7 | | | | | | | | |
| | | | 6 | Deciduous | 8.6 | | | | | | | | |
| | | | 10 | Alfalfa | 14.3 | | | | | | | | |
| | | | 12 | Var. veg. | 17.1 | | | | | | | | |
| | | | 30 | Oats & grasses | 42.8 | | | | | | | | |
| | | | 2 | Ornamental | 2.9 | | | | | | | | |

*Crops and acreage not all continuous through season.

[1]Cooperator Maverick County Water Control and Improvement District #1 (H.A.W. Frick farm) - (Water measured with 9-inch concrete Parshall flume.)

[2]Cooperator Maverick County Water Control & Improvement District #1 (Water measured with 3 ft. concrete Parshall flume.)

[3]Cooperator W. H. Brown. (Water measured with 4-ft. rectangular weir).

[4]Cooperator Ray Wood. (Water measured with 6-inch metal Parshall flume).

[5]Cooperator J. D. Wood. (Water measured with 10-inch Sparling meter).

[6]Cooperator Harrison Stafford. (Water measured with 16-inch Sparling meter).

[7]Cooperator Tom Babbs. (Water measured with 16" Sparling meter).

[8]Cooperator Texas Agricultural Experiment Station. (Water measured with 10-inch Sparling meter).

[9]Reservoir evaporation subtracted.

Table 2.--Amount of water pumped for irrigation at Texas Agricultural Experiment Substation No. 19, Winter Haven (February 1950 to October 1950, inclusive)

| Month | Total time pump was operated (1) | Total amount of water pumped | | Average discharge of pump | Precipitation | Evaporation losses (3) | Average depth of water table below ground surface | | |
|---|---|---|---|---|---|---|---|---|---|
| | | in gallons | in acre-feet (2) | | | | Start of pumping period | End of pumping | Difference or drawdown |
| 1950 | Hours | | | gallons per minute | Inches | Inches | Feet | Feet | Feet |
| February | 49.08 | 2,426,500 | 7.45 | 824 | 0.79 | 1.725 | 135 | 201 | 66 |
| March | 208.73 | 8,988,600 | 27.59 | 718 | .08 | 4.313 | 158 | 227 | 69 |
| April | 149.50 | 5,364,600 | 16,46 | 598 | 1.70 | 3.978 | 174 | 199 | 25 |
| May | 65.42 | 2,185,500 | 6.71 | 557 | 4.00 | 4.998 | 152 | 187 | 35 |
| June | 58.50 | 2,030,300 | 6.23 | 578 | 4.57 | 5.704 | 136 | 187 | 51 |
| July | 147.50 | 5,433,500 | 16.68 | 614 | 3.68 | 7.297 | 135 | 185 | 50 |
| August | 160.00 | 6,125,800 | 18.80 | 638 | 2.41 | 6.626 | 146 | 190 | 44 |
| September | 122.50 | 4,822,700 | 14.80 | 656 | 4.33 | 4.816 | 152 | 207 | 55 |
| October | 187.50 | 6,673,900 | 20.48 | 593 | .18 | 3.912 | 152 | 209 | 57 |
| Totals | 1,148.73 | 44,051,400 | [4]135.20 | | 21.74 | 43.369 | | | |
| Mean | | | | 642 | | | 149 | 199 | 50 |

[1]The throttle of the engine was wide open for 58 percent of the water pumped (average 784 gpm.)
The throttle of the engine was partly open for 42 percent of the water pumped (average 560 gpm.)
[2]1 acre-foot = 325,829 gallons.
[3]From a Bureau of Plant Industry evaporation sunken pan; size, 72 inches diameter x 24 inches deep.
[4]Applied to 70 acres of varied irrigated crops.

Table 3.--Comparison of standardized meteorological and evaporation data for certain locations in Texas (through October 1950)

| Station | Location: Area | Location: Stream | Location: Elevation above datum | Location: Latitude | Location: Longitude | Length of data | Rainfall | Wind movement | Mean temperatures: Maximum | Mean temperatures: Minimum | Evaporation losses: Weather Bureau pan, diam. 48" depth 10" | Evaporation losses: B.P.I pan[2] diam. 72" depth 24" (sunken) | Evaporation losses: Div. of Irr. pan diam. 24"3 depth 36"3 (screened) | Coefficients for conversion of evap. from: W.B. pan to evap. from Div. of Irr. pan | Coefficients for conversion of evap. from: W.B. pan to evap. from B.P.I. pan | Coefficients for conversion of evap. from: Div. of Irr. pan to evap. from B.P.I. pan |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Ft. | | | Yrs. | Inches | Miles | Deg.F. | Deg.F. | In. | In. | In. | Ratio | Ratio | Ratio |
| Buchanan Dam | Central | Colorado | 1,025 | 30°44' | 98°25' | 7 | 28.80 | 30,134 | 78 | 54 | 79.61 | 64.65 | 61.97 | 0.78 | 0.81 | 0.96 |
| Mansfield Dam | Central | Colorado | 550 | 30°22' | 97°55' | 6 | 27.97 | 21,389 | 81 | 56 | 70,02 | (1) | 60.03 | .86 | -- | -- |
| Wm. Harris Reservoir | Gulf Coastal | near Brazos | 40 | 29°15' | 95°33' | 1.83 | 48.08 | 23,625 | 80 | 61 | 56.86 | 48.18 | 43.31 | .76 | .85 | .90 |
| Lake Kickapoo | North | Little Wichita | 1,045 | 33°40' | 98°47' | 2.75 | 30.33 | 56,909 | 72 | 53 | 80.86 | 64.66 | 63.60 | .79 | .80 | .98 |

[1]Bureau of Plant Industry evaporation pan was not used at Mansfield Dam.
[2]B. P. I. = Bureau of Plant Industry.
[3]Div. of Irr. = Division of Irrigation.

Table 4.—Comparison of mean evaporation and meteorological data during periods of good and poor exposure at Buchanan Dam Station, Tex. (through October 1950)

| Period | Temperatures: Maximum | Temperatures: Minimum | Rainfall | Wind movement | Evaporation losses: Weather Bureau pan | Evaporation losses: Bureau of Plant Industry pan | Evaporation losses: Division of Irrigation Pan | Coefficients for conversion of evaporation from: Weather Bureau pan to evap. from Div. of Irrigation pan | Coefficients for conversion of evaporation from: Weather Bureau pan to evap. from Bur. of Plant Ind. pan | Coefficients for conversion of evaporation from: Division of Irrigation pan to evap. from Bur. of Plant Industry pan |
|---|---|---|---|---|---|---|---|---|---|---|
| | Deg.F. | Deg.F. | Inches | Miles | Inches | Inches | Inches | Ratio | Ratio | Ratio |
| 1943-48 (good exposure) | 77 | 54 | 30.35 | 32,503 | 81.18 | 65.48 | 62.50 | 0.77 | 0.81 | 0.95 |
| 1948-50[1] (poor exposure) | 79 | 53 | 24.94 | 22,166 | 75.70 | 62.53 | 60.68 | .80 | .83 | .97 |

[1]Concrete building (pavilion) was constructed within 10-15 feet of station during 1948.